Recommend Approval: _____ **Team Leader** **Date** _____ **Division Chief** **Date**	Maryland Department of Transportation State Highway Administration Office of Materials Technology MARYLAND STANDARD METHOD OF TESTS	
Approved: _____ **Director** **Date**	**QUALIFICATION OF LONGITUDINAL TIE DEVICES**	**MSMT 512**

SCOPE:

This procedure is used for testing tie devices used in securing contiguous traffic lanes of portland cement concrete pavement or a traffic lane and concrete curb or combination curb and gutter.

MATERIALS AND EQUIPMENT:

1. Universal Testing Machine conforming to E 4.
2. Compressive stress-strain recorder.
3. Spherically seated bearing apparatus with 12 in. diameter hole through the center.
4. High-strength steel rod.
5. Steel plate 12 x 12 x 2 in. with a 6 in. diameter hole through the center.
6. Moist closet conforming to T 126.

TEST PROCEDURE:

BOND STRENGTH

1. Assemble two 10 in. cube molds, each containing a tie device centered on one face. The tie device shall extend into the mold the same distance as would be embedded in the pavement. If the tie device has dissimilar ends, assemble 2 molds for each end. Fill each mold with Mix No. 6 concrete.
2. In addition, mold 2 compression test cylinders for each batch of concrete used to fill the molds.
3. Place the specimens and cylinders in a moist closet for a minimum of 48 hr before removing the molds.
4. Remove the molds and return the specimens and cylinders to the moist closet until they have cured for a total of 7 days.
5. The day the specimens are to be tested, determine the compressive strength of the cylinders to verify that the concrete has attained strength of at least 3500 psi.

6. The 120 K universal testing machine shall be set up as shown in Figure 1.

7. Install a 3 in. female expansion shield in the center of the opposite face of the specimen from which the tie device is anchored.

8. Fasten a lifting ring to the previously installed expansion shield then use a chain fall to place the specimen on the upper bearing plate.

9. While the specimen is still slightly above the bearing plate, thread the high-strength rod into the device with the pre-marked gauge length going through the upper crosshead.

10. Install the retaining cage and secure the opposite end of the rod against the plate on the bottom of the lower crosshead. Firm contact should be made between the plate and the nut.

11. Attach the deflectometer magnet to the rod at the gauge length mark. Adjust the deflectometer so that the arm is in firm contact with the magnet.

12. Select the testing machine range, deflectometer magnification, and appropriate chart paper based upon the anticipated loads.

13. Adjust the recorder and set the testing machine rate of load to 3000 lb/minute.

14. Load the specimen at the established loading rate until 90 percent of the chart paper has been used. After turning the recorder off and moving the magnet and deflectometer away from the high-strength rod, continue loading the specimen until failure occurs.

15. Remove the specimen from the testing machine in the same manner as it was installed.

16. When testing special longitudinal tie devices such as expansion shields, the Contractor shall install three of the devices in previously molded 10 in. cubes. The installation procedure shall be the same as is intended to be used on the project. Testing shall be done as in Steps 7 through 15.

TENSION TEST

1. Remove the hooks or heads from both ends of two tie devices.

2. Ensure the device is tightly assembled, then mark a 4 in. gauge length centered over the sleeve.

3. Secure the device in the universal testing machine and determine the load at which the gauge length elongates to 4.10 in. or a definite yield is observed.

4. Test both specimens as in Steps 2 and 3.

CALCULATIONS:

Determine the load at a slippage of 0.1 in. by drawing the modulus line of the high-strength rod in the proper units offset from the specimen graph 0.1 in. When the maximum load is reached before the 0.1 in. slippage, the maximum load shall be used in the calculations.

Determine the frictional force as follows:

$$F = \frac{\frac{S}{L}}{5 \text{ in. of spacing}}$$

where:

F = frictional force in lb/ft per ft of spacing,

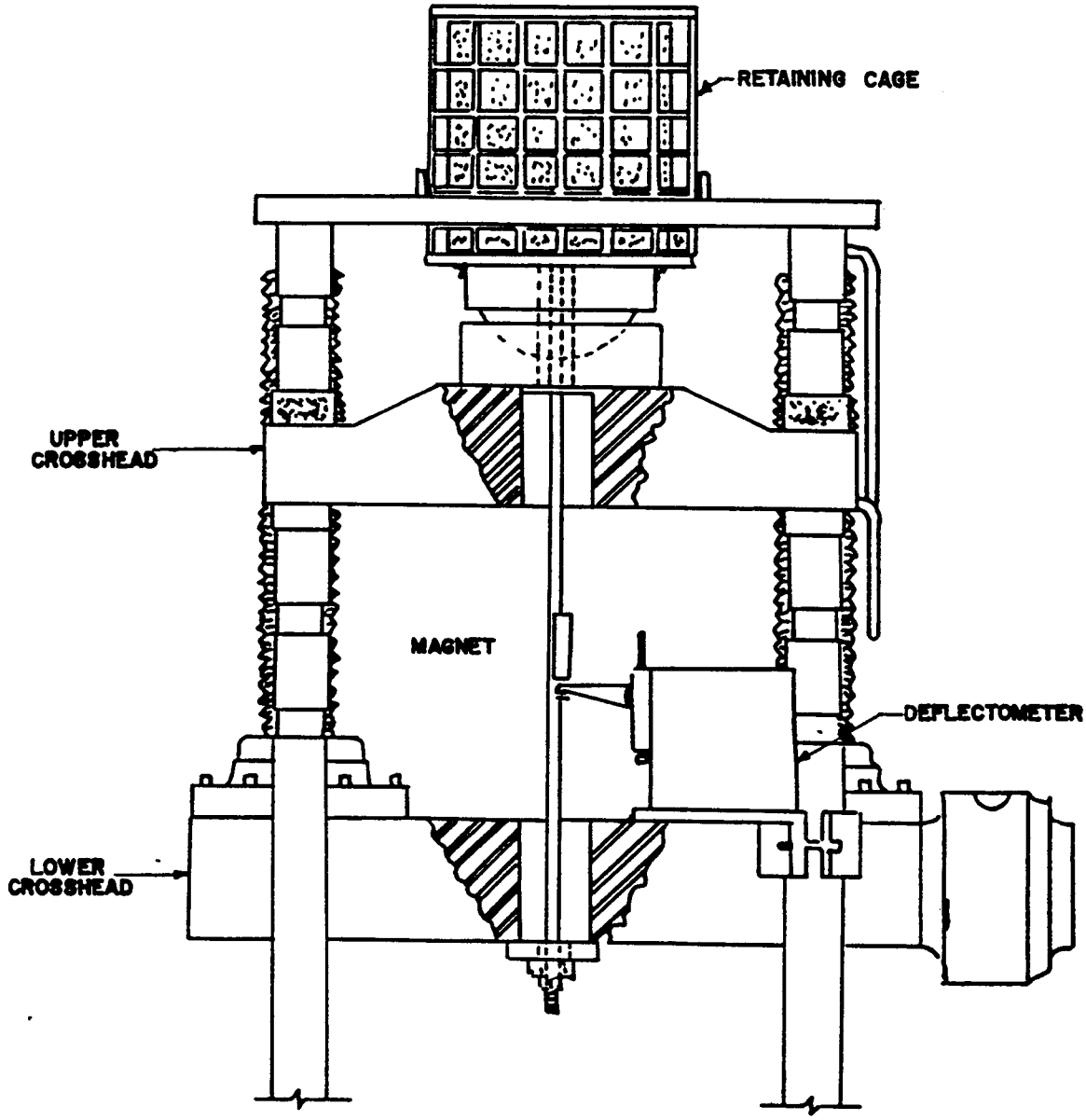
S = yield strength or bond strength whichever is smaller in lb total load, and

L = distance in ft of joint to the nearest free edge.

REPORT:

Report the frictional force to the nearest 10 lb.

QUALIFICATION OF LONGITUDINAL TIE DEVICES
APPARATUS ARRANGEMENT FOR SLIPPAGE DETERMINATION



MSMT 512 – FIGURE 1